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ABSTRACT:

A novel method for measuring an adhesion force of single yeast cell is proposed based on a nanorobotic manipulation system inside an environmental scanning electron microscope (ESEM). The effect of ambient humidity on a single yeast cell adhesion force was studied. Ambient humidity was controlled by adjusting the chamber pressure and temperature inside the ESEM. It has been demonstrated that a thicker water film was formed at a higher humidity condition. The adhesion force between an atomic force microscopy (AFM) cantilever and a tungsten probe which later on known as a substrate was evaluated at various humidity conditions. A micro-puller was fabricated from an AFM cantilever by use of focused ion beam (FIB) etching. The adhesion force of a single yeast cell (W303) to the substrate was measured using the micro-puller at the three humidity conditions: 100%, 70%, and 40%. The results showed that the adhesion force between the single yeast cell and the substrate is much smaller at higher humidity condition. The yeast cells were still alive after being observed and manipulated inside ESEM based on the result obtained from the re-culturing of the single yeast cell. The results from this work would help us to understand the ESEM system better and its potential benefit to the single cell analysis research.